

Appln No. 09/807,297
Amdt. Dated February 12, 2004
Response to Office action of October 3, 2003

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REMARKS/ARGUMENTS

The amendment to claim 130 is simply to clarify that not all of the nozzle rim layer is removed. It is respectfully submitted that this feature was already implicit in the claim (ie, by the simple fact that the nozzle rim would implicitly be formed by the remainder of the nozzle rim layer), and hence adds no new matter, nor any new issues for you to consider.

I have also added a new claim 138, which makes it clear that the sacrificial layer is removed during production. Again, it is submitted that this claim adds no new matter (see Figs 59 to 72 for disclosure in support) and raises no new issues for consideration since it is dependent upon a base claim that I respectfully submit is allowable.

Turning to the claim rejections, I respectfully but strongly disagree with many of the conclusions you have drawn in the Office Action dated 3 October 2003.

To begin with, you have rejected all of claims 130 to 133 based on Fig. 1(a) of the earlier Silverbrook reference. However, Fig. 1(a) is largely silent on many of the features defined in those claims.

Claim 130 requires that a rim material layer be formed over a "sacrificial layer". In contrast, Silverbrook discloses an annular heater that surrounds a nozzle formed in a silicon substrate. There is no "sacrificial" layer, as that term would be understood by one skilled in the art of microelectromechanical systems (MEMS). By "sacrificial", it is understood that the layer is an intermediate protective or structure-forming layer that is removed once it has fulfilled its purpose during the manufacturing process. I invite you to consult the internet or a suitable technical dictionary to confirm my comments in this regard. However, I make the point that the term "sacrificial layer" is notoriously well known and understood in the field of integrated circuit (and particularly MEMS) design and manufacture. Should you not be able to find a reference that convinces you that this is the case, I would be pleased to provide a declaration to that effect from a suitably qualified person.

In support of this interpretation of "sacrificial", I draw your attention to Figs 59 to 72, which show the sacrificial layer being formed (Fig. 59), then a nozzle layer being laid on top of that (the "Deposit Chamber Walls" step in Fig. 65). A planar portion of the nozzle layer is removed in Fig. 67 to leave a nozzle rim (surrounding nozzle 259 in that Figure). The sacrificial layer is then removed in Fig. 71. Please note that I have referred to this sequence only in support of my contention that the term "sacrificial layer" is intended to have the meaning of an intermediate layer that is removed once it has fulfilled its purpose in the production sequence.

Claim 130 also defines that a rim material is deposited over the sacrificial layer, and that planar removal of the rim material is then performed to form the nozzle rim. The Silverbrook reference discloses no such steps. Indeed, there is no disclosure at all of the manufacturing steps that lead to the structure shown in Fig. 1(a) of the Silverbrook reference. In the absence of any such disclosure, I respectfully submit that it is completely inappropriate to raise this document against the present claims. Should you wish to maintain this objection, I would appreciate it if you would point out where in the reference there is disclosed "planar removal of part of at least said rim layer".

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In relation to claims 131 to 133, the Silverbrook reference does not show or even suggest:

- "chemical - mechanical planarization of said rim material layer" (claim 131).
- "parts of said sacrificial layer are also removed by said planar removal" (claim 132).
- the "planar removal process is an etching process" (claim 133).

Regarding the Wen reference, which is clearly based on the earlier Silverbrook reference, there is again utterly no disclosure of a manufacturing process that involves planar removal of rim material, as claimed in claim 130. Similarly, there is no disclosure of a sacrificial layer, for the reasons set out in relation to the Silverbrook reference.

Regarding claim 134, you have proposed that it would be obvious to combine Wen (or Silverbrook) with Tsu. I respectfully disagree.

To begin with, Tsu is concerned with an integrated circuit capacitor, which has nothing to do with MEMS printer nozzles. Even if you regard the field of art as simple "integrated circuits", the fact is that one looking to overcome problems in nozzle construction would not look to capacitor design to solve them.

Moreover, the motivation you have given for why one would replace the materials in Silverbrook and Wen with those disclosed in Tsu is utterly irrelevant to the function of the nozzle rim. As described in Wen, the function of the nozzle rim is to "provide a contact point for meniscus 60". Yet you have suggested that good oxidation resistance and a high work function would be motivating factors in using the materials from Tsu. With respect, this is clearly not relevant to the nozzle rim disclosed in either Silverbrook or Wen. There is nothing in any of the documents to suggest that there is any difficulty to be overcome in using SiO₂ as a nozzle rim material. In the absence of such motivation in the documents (including Tsu), it is submitted that it is improper to suggest it would be obvious to use those materials in the Silverbrook or Wen references.

In contrast, the preferred materials defined in claims 134 to 137 relate to the fact that the preferred form of the invention forms the nozzle in a moveable structure that must have relatively good strength and rigidity. The strength and rigidity requirements of the Silverbrook and Wen nozzles are relatively low, since they do not have to cope with any relatively high forces.

For all these reasons, it is submitted that it would not be obvious to combine the features of Tsu with those of Wen or Silverbrook in order to anticipate claims 34 to 37.

It is respectfully submitted that all of the Examiner's objections have been successfully traversed. Accordingly, it is submitted that the application is now in condition for allowance. Reconsideration and allowance of the application is courteously solicited.

Very respectfully,

Applicant:



KIA SILVERBROOK

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